

— Established 1833. —

GREENWICH POTTERY,

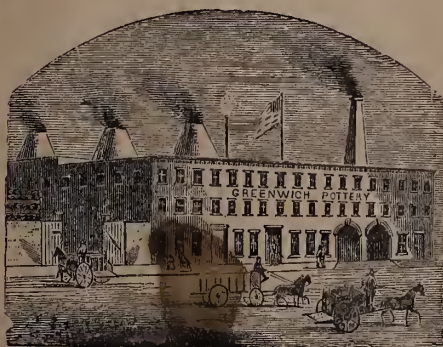
M. A. SHUTE, Ex't's,

Manufacturer of Steam Pressed Vitrified Drain, Sewer and Water

PIPE.

GEO. H. HASTINGS,

Superintendent.



415 to 429 West 18th Street, bet. 9th & 10th Aves.,

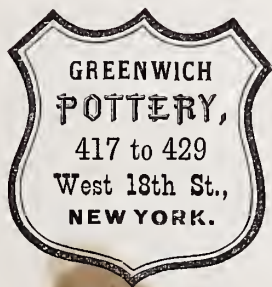
NEW YORK.

New York:

STYLES & CASH, STEAM PRINTERS AND STATIONERS,
77 Eighth Avenue.



OUR PIPES ARE BRANDED,



71
6290
6856
1873

AT THE
COMMONS

PRICE LIST OF DRAIN PIPE.

Size of Bore.	Main Pipe, per ft.	Bends & Elb's, each.	Branches each, one foot Lengths.	Traps, each.	Six inch Sewer Connections, each, 40c.
2 in..	\$0 13	\$0 40	\$0 48	\$1 00	INCREASERS & REDUCERS charged at the price of Bends, measured at their largest open- ings.
3 " ..	16	50	61	1 25	
4 " ..	20	65	75	1 75	
5 " ..	25	85	90	2 50	
6 " ..	30	1 15	1 05	3 50	
7 " ..	35	1 50	1 20	5 00	
8 " ..	45	2 00	1 45	6 00	
9 " ..	55	2 50	1 70	7 00	
10 " ..	70	3 00	2 00	8 00	
12 " ..	80	3 75	2 52	
15 " ..	1 25	5 00	LARGE BRANCHES, PER LINEAL FOOT. 15x6 or under, 1.75 15x7 or over, 2.25 18x6 " 2.50 18x7 " 3.00		OVAL FLUE PIPE. 8x4 in., per ft., 40c. 12x4 " " 50c. 12x6 " " 60c.
18 " ..	1 60	7 50			

TABLE showing Weight, Capacity for Discharge, and Strength of our Pipe.

Size of Bore.	Weight per foot.	Fall per 100 feet without any head.	Discharge Per Minute.	VITRIFIED PIPE, Tested by competent Engineers, sustained an internal pressure of 33 lbs. per square inch. CEMENT PIPE sustained an internal pressure of only 8 lbs. per square inch. VITRIFIED PIPE, with a wall one inch thick, sustained a column of water 76 feet high, while the Cement Pipe, with a wall one and a quarter inches in thickness, would sustain only a column 18 feet high.
2 in..	3 $\frac{1}{3}$ lbs.	12 inches.	16 gals.	
3 " ..	5 $\frac{1}{2}$ "	"	50 "	
4 " ..	8 $\frac{1}{2}$ "	"	99 "	
5 " ..	10 $\frac{1}{3}$ "	"	174 "	
6 " ..	13 "	"	277 "	
7 " ..	14 $\frac{1}{2}$ "	"	427 "	
8 " ..	18 "	"	576 "	
9 " ..	21 $\frac{1}{2}$ "	6 inches.	578 "	
10 " ..	27 $\frac{1}{2}$ "	"	1061 "	
12 " ..	36 "	"	1220 "	
15 " ..	61 $\frac{3}{8}$ "	"	2108 "	
18 " ..	78 $\frac{1}{8}$ "	"	3306 "	

WE desire to call the attention of dealers in Drain, Sewer and Water Pipe to the goods manufactured at the GREENWICH POTTERY, confident that we are offering an article unsurpassed by any, and much superior to many Pipes in the market.

In manufacturing our goods, we use only the fire clays best adapted for the purpose, and burn to a uniform vitrified body, that will withstand for ages the action of acids, sewage gases, etc., etc. Our glazing is thoroughly burned to and becomes a part of the body of the pipe, and cannot be removed nor destroyed by acids or by any other means. Our pipe is uniformly straight and true, with sufficient room in the socket for cement.

We are careful at all times in selecting out all imperfect pipe, and reject as *seconds* all *soft burned* or irregular shaped pieces.

Soft burned pipe will *not* last long in the ground, nor withstand action of frost if exposed to the weather. There is no economy in using a *cheap* pipe that will soon require to be replaced, nor will it improve a dealer's reputation to handle an inferior article.

Our pipe is made under a heavy steam pressure, giving them great strength and solidity, the socket and pipe are pressed at the same time, and in one piece, making them less liable to breakage and more desirable for shipping, than those made by other manufacturers, many of whom employ hand labor to put on the socket.

We do not claim that ours is the *only* good pipe ; but assert that there are many inferior pipes offered, and we *know* that ours is one of the VERY BEST in the market.

We also manufacture Round and Oval FLUE PIPE, for hot air and ventilating purposes.

We make an excellent FIRE BRICK, and can furnish Fire Cement in any quantity.

The Engineer for Construction of Sewers, New York City, reports February, 1873, that the cost of cleaning and keeping in repair *Brick Sewers* in no year has been less than ten times the cost of cleaning and keeping in repair *Pipe Sewers*. Some years the difference has been much greater—this being for *equal lengths* of each sewer.

We quote from "Economic Geology as applied to the Arts and Sciences," David Page, Edinburgh: "Sewage pipes of fire clay, when thoroughly glazed and carefully laid, afford by far the best material for the purpose which science has invented. Indeed, so far as experience goes, there is nothing so *durable*, so *clean* and *sweet*, so *easily flushed*, as *well made, well glazed* fire clay pipes, and thus, for sanitary purposes, they stand unrivaled. The stone built drain requires a large amount of water to flush it, *decays* in course of time, *leaks*, becomes a refuge for rats; while the pipe drain is flushed with a mere trickle of water, endures for several generations, and gives no harbor for vermin."

Beckwith's "Reports, Pottery, &c., International Exhibition, London, 1871," says, "Terra Cotta, when properly made, is one of the most durable materials that can be used for architectural purposes. Specimens made in London over 100 years ago, exposed to the weather ever since, are still perfect. The strength of *well made* Terra Cotta is surprising: a piece of a 4 inch column, tested at the World's Exhibition, 1851, required a pressure of 400 tons to the square foot to crush it, or as much as granite."

In a paper read by Mr. C. Barry at the Architectural Conference held in London, he gave the result of experiments on Terra Cotta, showing the crushing strength of this material to be $7\frac{1}{2}$ times that of brick.

Vitrified pipes in good condition have been found among the ruins of ancient cities, and pieces laid by the Romans over 2,000 years ago have recently been dug up, still perfect.

Our Pipe has been in actual use a little over 30 years, and has in no instance failed to stand the test, so that we have good reason to be confident as to its durability.

SLIP GLAZE *versus* SALT GLAZE

Certain manufacturers who *Salt Glaze* their Pipe, have endeavored to create an impression that it is more *durable* than *Slip Glaze*, though all concede that *Slip Glaze* is smoother.

The object of glazing a pipe is *not* to make it more durable, but to make a smooth surface. Vitrified pipes that *never were glazed* have been dug up in good condition, after being buried centuries.

The smoother the surface of a pipe, the more readily will it discharge the contents of a sewer, and there will be less possibility of obstruction, grease and solid substances finding less to adhere to.

As a matter of fact, *Salt Glaze* is *not* more durable than *Slip Glaze*. Chemical tests have shown that neither are easily acted upon, yet after long contact with acid the *Salt Glaze* was *destroyed*, while the *Slip Glaze* was *uninjured*.

It is certain that a *Slip Glaze* can only be formed on a clay *strong* enough to resist the intense heat required to melt the *Slip*. It requires an equal heat to make the *best specimens* of *Salt Glaze*, but that *half Glaze*, which has the appearance of *steam* on the pipe, is the result of an attempt to *Salt Glaze* a *weak* clay.

A *Slip Glaze* is made by dissolving "Albany Clay" in water, and dipping each pipe in the solution prior to burning. The "Albany Clay" will not melt to form a glaze except at a heat that will run "brick clay" into a fluid—a heat which even an inferior "fire clay" cannot resist.

A *Salt Glaze* is made by throwing common salt into the kiln at certain stages of heat, which, by vaporizing, produces the dull glazed appearance.

The *material* is equally cheap in either case. The extra *handling* makes the *Slip Glaze* cost somewhat more, but we *believe* it to be the most durable; we *know* it makes a more desirable surface.

VITRIFIED versus CEMENT PIPE.

*The Opinions of Engineers throughout the Country,
relative to the practical utility of Vitrified Glazed
Stoneware and Cement Pipe, obtained by J. B.
Moulton, Esq., City Engineer, St. Louis, Mo.*

[TAKEN FROM THE ST. LOUIS DEMOCRAT OF MARCH 28, 1872.]

ENGINEER'S DEPARTMENT, }
ST. LOUIS, March 27, 1873. }

To the Editor of the Democrat :

The question as to the comparative merits of cement pipe and clay or stoneware pipe, for sewerage purposes, has been so thoroughly agitated of late, perhaps it is no more than is due to the public, the Sewer Committee, and myself that the correspondence which has been had with eminent civil engineers throughout the United States, for the purpose of getting the best attainable information on the subject, should be published in full; and I furnish you herewith the whole of said correspondence, and request you to publish it all, pro and con, so that our citizens may be able to judge for themselves whether or not the Sewer Committee acted wisely in excluding the cement pipe from the city sewers.

Yours respectfully,

J. B. MOULTON.

SOUTHERN HOTEL, }
ST. LOUIS, August 26, 1872. }

Col. J. B. Moulton, City Engineer :

SIR : I am in receipt of your letter of this date, in which you state that there is now a controversy going on as to the relative value of cement and glazed, or stoneware, sewer pipe in this city, and asking my opinion as to the matter.

I reply by saying I have never used the cement pipe for the purpose of sewerage, and have no personal knowledge of its value in that connection.

While I had charge of the sewerage works of Cincinnati, none but the vitrified pipe was used, nor has any other been used in that city so far as I know. Only vitrified pipe is used in Washington at present, and I am not certain that cement has ever been used there. As to whether there was or was not any scientific test made of the cement pipe in Washington, I cannot say until my return. But it is not used there at all.

I regard the Scotch pipe as the best for the purpose ; and the American, when well made, as almost equal to it. I am of opinion that cement pipe might be made to answer well, but it is open to the objection of porousness. As a rule, it has less strength, and is liable to great variation in quality, growing out of the difference in material and the proportions used, and, finally, from the manner of making. As to the action of the acids and alkalies upon it, I should not regard this as a serious objection, since my observation upon the mortars used in brick sewers satisfies me that there is little danger from this cause. I should prefer the vitrified pipe by all means.

On my return to Washington I will reply to the other interrogatories you propound.

Very respectfully, etc.,

R. C. PHILLIPS,
Chief Engineer Board of Public Works, Washington, D. C.

BOARD OF PUBLIC WORK, }
CHICAGO, August 27, 1872. }

J. B. Moulton, Esq., City Engineer :

DEAR SIR : In conformity with your request of 26th, I send you

the accompanying copy of a report I made on the 16th of July to our Board, on the subject of cement sewers.

Since then I have received a letter from the City Engineer of Cleveland, O., who speaks very decidedly in favor of cement sewers, after an experience of three years with them in that city. I have also conversed with Mr. Wesson, who had charge of the sewerage department of the Croton Aqueduct Board for a number of years, and he speaks very decidedly against them. He told me that he dug down to quite a number in Jersey City, and found every one more or less disintegrated on the outside.

Yours very respectfully, E. S. CHESBROUGH.

CHICAGO, July 16, 1872.

Board of Public Works :

GENTLEMEN: The secretary's letter of the 13th, informing me that you desire a report from me of "the value," in my opinion, "of cement pipes for sewerage purposes," has been received. I take it for granted that the Board meant cement pipe as compared with hard-burnt or vitrified clay, as no other kinds are used to any considerable extent in this country, though wood, asphalt, and iron are in particular localities used for special reasons.

I have given personal attention to this subject for about twenty years, and have both conversed and corresponded with other engineers relative to it.

Cement pipe sewers have their advocates, and are used to a considerable extent in Brooklyn, Buffalo, Jersey City, and New Haven, and other cities. Some have been laid twenty years, and are in good condition yet. Others have failed in less than three years. Similar failures occurred with hard-burnt pipes in England, where, for years after their introduction, there was strong opposition to them, until their manufacture was brought to comparative perfection. Now the use of these pipes in that country is very general, especially for house drains.

Either kind of pipe requires skill and faithfulness on the part of those in charge of the laying of the sewers. The case, however, of judging of the suitableness of a burnt pipe for a sewer is much greater than in the case of a cement pipe; in fact, it is very difficult, if not impossible, to be certain with regard to the cement pipe, while it is not so with regard to hard-burnt clay.

Cement pipes have been slowly disintegrated by certain gases and acids emptied into them. Some very striking instances of this kind occurred in San Francisco, where urine from privies was discharged into the cement pipes. Nothing of this kind has ever occurred, so far as I can learn, with well burnt pipes.

My opinion is that hard-burnt or vitrified clay pipe should be preferred for sewerage purposes to cement pipe, because of the much greater certainty of getting a good article of the former than of the latter ; and in this respect I have the concurrence of several distinguished members of my profession, who have come to their conclusions on the subject after years of observation and experience.

Respectfully submitted,

(Signed) E. S. CHESBROUGH, City Engineer.

OFFICE OF THE COMMISSIONERS OF SEWERS,
CINCINNATI, August 28, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR SIR: Yours of the 26th, making inquiries in regard to the use in this city of cement pipe for public sewers is just received.

Our Commissioners of Sewers, as well as myself, are not in favor of using cement pipe, for sewerage purposes, confining ourselves entirely to the use of glazed stoneware or vitrified pipe. We do not think the cement pipe for durability and its capacity to resist the action of acids and other deleterious substances which are committed to public sewers, has been sufficiently tested by time. And we have high authority for believing pipe made of burnt clay, glazed and vitrified, will last for centuries. In matters of this kind, we do not care to experiment. Very truly yours,

A. W. GILBERT.

LOUISVILLE, KY., August 28, 1872.

J. B. Moulton, City Engineer, St. Louis :

DEAR SIR: I am in receipt of yours of the 26th inst., asking my opinion of cement pipe for sewerage purposes. I have to reply that the cement drain pipe, as made here, is good ; they are carefully made, and are more uniform and in better shape than the stoneware, and average about 15 per cent. cheaper. We are using them in almost all cases. Until recently, however, the stoneware was pre-

ferred ; but, as a great many of them were shattered by burning, and the supply becoming short, a trial was made of cement, which gave perfect satisfaction. I am of the opinion that the cement drain will answer every purpose. Would request your writing to the Engineer of Brooklyn, who, I understand, is using large quantities, and we are using the same "patent process" that he is. Will cheerfully give further information if desired. Very respectfully,

THOS. P. SHANKS, City Engineer.

PHILADELPHIA, August 29, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR SIR : The branch sewers in this city are generally built of brick, and vitrified clay pipes are used for attachments and house-drainings, and occasionally for short distances in streets.

Cement pipes are manufactured here on a limited scale, but, so far as my observation goes, have not given satisfaction, so much care is required in obtaining good material, and having them properly made, that the quality cannot be depended on. Although somewhat cheaper than the vitrified pipe, there is so much uncertainty in them that I should not be willing to risk their general introduction.

Cases have been reported to me of cement pipes where they have all had to be taken up, on account of their deterioration. Brick are cheaper here, and of such excellent quality that they have the preference for large size drain. Yours truly,

SAM'L L. SMEDLEY, Chief Engineer.

BOSTON, August 29, 1872.

J. B. Moulton :

DEAR SIR : Your note of the 26th inst. was received this morning, and in answer to your inquiries relative to cement pipe for drainage purposes, I beg leave to say that the duty of prescribing or even recommending the style or material for drain pipes in this city, does not devolve upon me, but upon an officer styled the "Superintendent of Sewers," who is a professional civil engineer, and has made drainage engineering a specialty. I have frequent intercourse with him, and our views generally coincide on matters relative to his department. He informs me that he has laid several thousand feet of

it, and has had no trouble from sewer acids, but that it frequently breaks or cracks longitudinally, when laid in clay or heavy soils; but in sandy soils, where care is taken to pack the sand well around the pipe, it stands very well. He also says that he has frequently to reject a portion of the pipe when delivered on the ground, on account of imperfections. The cement pipe in use in this vicinity is made from the best of Newark new cement and sea-washed gravel, screened to a size considerably coarser than the coarsest of bank sand, and in some cases Portland Cement is used. The article manufactured here by Messrs. Day & Collins is as good a cement pipe as I have ever seen, but the best, I have no hesitation in saying, is inferior to good vitrified clay pipe.

If I had charge of the sewerage works of this or any other city, I should recommend the use of the vitrified clay pipes in preference to cement, notwithstanding the difference in cost. I regard cement pipe as worthless unless made of the best materials, and even then it is not as good as the other. Yours truly,

N. HENRY CRAFTS,
City Engineer.

CHIEF ENGINEER'S OFFICE, }
BROOKLYN, August 29, 1872. }

MY DEAR SIR: Your note of the 26th inst., in relation to cement pipe, is received. I have so much correspondence in answer to inquiries as to cement pipe that I had the enclosed copied by the dozen to save the trouble of writing special answers, and usually confine myself to sending one; but in your case will break through my custom for, if I mistake not, we are "old fellows together."

In the first place, the only stoneware pipe which is approved here is the imported "Scotch" pipe. It is truer in shape—a most important feature—more uniformly burnt, less brittle, and with a better glaze. All these merits, with the additional cost of transportation, and consequent loss by breakage, makes them more expensive than the American pipe, and it is with this expense that we compare the cement pipe. The latter, when well made, as Knight's pipe is, and well seasoned, say eight or nine months, is, so far as we can judge, equally good with the "Scotch" pipe. You know we are beginning to

import Portland Cement, as some two or three times the strength of our best cements. A small addition of this adds great strength to the cement pipe. The economy in first cost of the best cement pipe is still so much cheaper than the "Scotch" as to render it popular with the taxpayers, even if an occasional failure was the result. The possible difference in your clay, and the additional cost and inferiority of your cements, may render your stoneware pipes even better than your cement pipe. I am free to confess that, in my opinion, the value of the pipe is very largely due to the careful and faithful method of making and seasoning pursued by Knight in his manufacture, and I would be very cautious about using much pipe merely because it was made of cement. Truly yours,

J. W. ADAIN.

J. B. Moulton, City Engineer, St. Louis.

(Statement inclosed in foregoing.)

BROOKLYN, N. Y.

SIR: In reply to your note of this date, I would beg leave to say that we have laid the cement pipe of Knight to a large extent in this city, as the following statement will show:

Year.	Feet.
To 1862.....	28,987
1862	24,235
1863.....	15,156
1864.....	13,475
1865	45,840
1866	34,990
1867	18,033
1868	78,457
1869	73,856
1870	108,513

And the last year some eight miles under contract. I would remark that the method of manufacturing the pipe has much to do with the durability. *Any* pipe of cement and gravel will not answer; but with good cement and clean gravel, well rammed, we have found the pipe to answer every purpose of a drain pipe, and no case to my

knowledge has transpired where it has given out from the action of any acids in the sewerage. The "Scotch" pipe is equal to it in durability, but costs from 25 to 40 per cent. more, and the difference in cost renders the cement pipe the cheaper, even with the defects which have appeared in some cases, attributable to the want of seasoning in the pipe after it was made, and before laying. This is important to look to. It is better than the American stoneware pipe, and, when made with the precautions I have named, is sufficiently reliable.

Respectfully,

J. W. ADAIN,
Chief Engineer.

BUFFALO, August 30, 1872.

J. B. Moulton :

SIR: On receipt of your letter of August 26th, I referred it to Mr. Rathbun, whose answer I inclose and fully indorse. All the pipe laid here has been done under my personal supervision. I have never heard of any failure in any sewer where it has been used.

The value of the pipe depends entirely on the quality of the cement and the sand, and the materials used here are perfectly satisfactory.

Mr. R. thinks that yours is made from Louisville cement, an article that he would not use.

The Rosendale cement is brought from near New York City, although a good quality of cement is made within twenty miles of Mr. R.'s works.

Yours respectfully,

JOHN M. DITTA,
Engineer.

[Letter inclosed in the foregoing.]

BUFFALO, N. Y., August 29, 1872.

John A. Ditta, Esq., City Engineer :

DEAR SIR: In looking over the St. Louis letter again, I observe that Mr. Moulton wants *your opinion*, and if you send him the opinion of some one else, he may think you dodge the question.

I should say to him that cement pipes have been in use, both for public and private sewers, in this city for seven years, and that no

failures are reported ; that large quantities are being continually used, and further, that the parties engaged in their manufacture in this city use only the very best of Rosendale cement and clean, sharp lake gravel, and manufacture a pipe that has been universally adopted, etc., etc.

I think that if you give him something like the above, with perhaps something else that you may think of, that it is all that will be necessary.

Truly yours, etc., etc.,

C. H. RATHBUN.

[From the card enclosed with this letter, it appears that Mr. Rathbun is a cement pipe manufacturer.]

OFFICE OF CITY ENGINEERS, }
PITTSBURG, September 2, 1872. }

J. B. Moulton, City Engineer :

DEAR SIR : Your favor of the 26th just received, and contents noted.

There has been a prejudice existing here relative to cement pipes, caused, partly, by disinclination to use anything that had not been thoroughly tested. That prejudice was strengthened by the poor quality of pipe offered by the party who began to manufacture here. The ignorance of workmen as to the proper treatment of cement, together with the poor quality of cement used, and the desire to produce as cheap an article as possible all led to confirm the existing antipathy toward it ; but that has given, or, rather, *is giving* way, at present, to a more favorable impression ; but our Councils have not yet authorized the use of it for sewers. We are putting in two short pieces of it to drain surface water across two streets. My own opinion is that pipe made out of a good quality of Portland Cement, "English" or "German," not too much reduced by a disproportion of sand, will stand the test required. In this opinion I am confirmed by the success with which it has been used in London, and a single test that has been made here, where cement has not been injuriously affected by the action of urine ; but the liability to get *poor cement*, even of the best brands, and the difficulty to get careful workmen to manufacture the materials, and the difficulty to discern any flaws that may be in the pipe, have been deemed sufficient reasons not to allow

its introduction here to any great extent. The manufacturer here is one of the most extensive contractors, and he is endeavoring hard to introduce his pipe wherever he can do so, guaranteeing it for a length of time. He has now come to the use of "Portland Cement" in making sewer pipe. We have a company here making "artificial stone" with the same quality of cement, and I have paid close attention to their work, examining the cement closely, and the conclusion to which I have come is that too much care cannot be exercised in the choice and manipulation of the material, and if care is not exercised the most unsatisfactory results will be produced, but, as I have said, there has not been time enough given here to tell from any extended experiments whether pipe properly made will withstand the action of the acids to which they are exposed in sewers, and therefore a positive opinion based on actual experiment and observation cannot be given.

I think that pipe properly made of the cement I have mentioned *may stand*, but I would not like to risk it in any extensive work ; but I do not *think* it will stand if made of any other than *that quality of cement*.

Regretting that I cannot give you any more definite information relative thereto, and hoping that if any instances throwing light on the subject fall under your observation, you will communicate to

Yours respectfully.

A. DEMPSTER.

BALTIMORE, September 2, 1872.

J. B. Moulton, Esq., City Engineer :

SIR : Your communication of the 29th is at hand, and I must say in reply that we have used the cement pipe manufactured in this city in two instances only.

Our sewers, for city purposes, are large—from four to seven feet in diameter—for which we use hard burnt brick in their construction.

Our experience with the cement pipe has been such as to compel us to report unfavorably upon its future use.

Two years ago we laid about 100 feet of the pipe, six-inch diameter, for the purpose of drawing a spring ; about six months ago we

were obliged to open it for repairs, it having failed to drain, when we found it had softened or yielded to the action of water to such an extent as to render two sections useless.

In regard to the "stoneware," or glazed pipe, I can say nothing officially, not having used it for city purposes. It is, however, quite extensively used for private sewers, and seems to answer very well.

You will excuse haste. Should you wish further information on the subject, I will be pleased to furnish in detail all I have.

Very respectfully,

JNO. H. TEGMEGES,
City Engineer.

TOLEDO, September 2, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : Here the use of cement pipe was discontinued after a short trial, and the vitrified salt-glazed pipe exclusively used in the construction of our pipe sewers, connections, etc., which I think to be quite superior to any cement pipe which I have seen tested, in evenness of texture, firmness, durability, and its qualities to resist the action of sewer acids.

Yours respectfully,

H. C. THATCHER,
City Engineer.

MINNEAPOLIS, MINN., September 2, 1872.

J. B. Moulton, Esq. :

DEAR SIR : The experiments I have made with cement sewer pipe are, that I filled a pipe with salt and water, and find that salt acts on them so that I think it would eat a hole through in no very long time. Acids will have a greater effect on them. And I know of no means of ascertaining which are good and which are poor. In our city here, for the above reasons, I recommended the use of vitrified stoneware pipe, which was adopted by the City Council.

I would be pleased to receive a copy of your laws relative to the paying for sewers, paving, etc.

Respectfully yours,

H. CARSON,
City Engineer.

MEMPHIS, TENN., September 2, 1872.

J. B. Moulton, City Engineer :

DEAR SIR: We have no sewerage here worth mentioning. What we have is of the vitrified "stoneware," with the exception of cement pipe laid from a hotel to the river. I have not had an opportunity of examining the latter, but am inclined to prefer the vitrified pipe.

Respectfully.

J. H. HUMPHREYS,
City Engineer.

LITTLE ROCK, ARK., September 2, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR SIR: Your letter, dated August 29th, asking my opinion in regard to cement sewer pipe, and those of stoneware, has come duly to hand.

I have, therefore, the honor to state that, in my opinion, stoneware pipes are far preferable to those of cement.

Your reason for abandoning the latter is, as far as my experience goes, perfectly correct, viz. : the want of uniform texture, the influence of acids, and easier breakage.

We have used in our city extensively the stoneware pipes, and have found the same, when hard burned, well vitrified and glazed, to answer all reasonable demands.

Respectfully yours,

GEORGE WEHE,
City Engineer.

LAWRENCE, KANS., September 3, 1872.

J. B. Moulton :

SIR: In reply to your inquiries in regard to relative value of cement and stoneware pipes, I can only say that I have used stoneware pipes with entire satisfaction. Specimens of cement pipe have been left at this and other cities. They are too delicate for use, and fall to pieces with the slightest blow. We have local manufactories, which make very fair stoneware and earthenware pipes at reasonable prices. I can see no good reason for abandoning them for a mere experiment.

Respectfully yours,

HOLLAND WHEELER, City Engineer.

HARTFORD, CONN., September 3, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR SIR: Yours of the 29th came to hand yesterday, and, in reply, I would say that very recently our Board of Street Commissioners decided, on my recommendation, not to lay any more cement tile. I was led to give this advice from a general idea of their worthlessness, which has been proved in several cases when we have taken up such sewers, some of quite recent construction. We found length after length entirely crumbled, and others that we succeeded in lifting out of the trench would break with a very slight blow. I think your reasons all hold good, and are sufficient to condemn their use.

We also object to the glazed tile, from difficulty of entering them for side sewers, as we have not yet adopted the plan of laying side connections when we lay the main sewer. We shall, in accordance with the above decision, hereafter lay nothing but brick sewers, the smaller ones of oval form, the large circular. If our experience is worth anything to you, I am glad to be able to give it to you.

Yours, very respectfully,

C. H. BUNCE, City Surveyor.

JERSEY CITY, September 3, 1872.

J. B. Moulton, Esq. :

DEAR SIR: In transmitting to you my opinion in regard to the merits of concrete drain and sewer pipes, I would say that my experience has led me to the conclusion that vitrified or glazed pipes are superior in every particular, and I have ordinarily endeavored to use as little cement pipe as possible. There can be no real question of which is the best.

I have given this subject the most thorough attention, and I am confident I am right, and time will prove it. Cement pipe never will answer a safe purpose until it can be manufactured so as not to become disintegrated after being laid in the trench and covered. I have known a sewer to cave in built of it, and make a most disagreeable state of affairs, from the fact of not knowing to what extent the break extended.

Very respectfully,

JNO. P. CULUDO, Chief Engineer.

RICHMOND, VA., *September 3, 1872.*

Mr. J. B. Moulton :

DEAR SIR : Within the last year I have passed through an experience in sewer piping, with a conclusion fully in accord with your own. My mind is settled on the superiority of stoneware pipes, and the uncertainties attending those of cement. I will not hereafter use the cement pipes in our city sewerage. Very respectfully,

CHARLES H. DIMMOCK,
City Engineer.

AUGUSTA, ME., *September 3, 1872.*

J. B. Moulton, City Engineer :

DEAR SIR : Your favor of the 29th is at hand, and in reply I would say my opinion in regard to cement pipes is the same as your own. Have found the same difficulty in regard to the texture of the pipes not being equal. Any one can see at a glance that the cement pipes will absorb the acids of the sewer, which will certainly destroy them. Were the sewers under my charge, I should certainly use the vitrified pipes for their conducting power alone, the polished surface presenting little or no resistance to the water and foreign matter. I do not know what patterns you may have, but the sleeve joint of our stone pipes is much better than that of the cement pipes. I am interested to know what the result will be. Should you have the leisure or inclination to respond, please address

NAT ABBOTT,
City Engineer.

BALTIMORE, *September 4, 1872.*

J. B. Moulton, Esq., City Engineer :

In reply to your letter of the 29th ult., directed to the "Engineer of the City of Wheeling," and requesting information as to our experience with cement and stoneware pipes, I have to say that I believe the former have not been at all used in Wheeling for sewers, unless it may have been by private parties, of which I have no knowledge.

My opinion would be decidedly in favor of the glazed pipe, within range of capacity suited to its strength.

Should you publish the result of your inquiries on this subject, I beg you will favor me with a copy.

Respectfully,
W. C. SMITH,
City Surveyor, Wheeling, Va.

NEWARK, N. J., September 4, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : Your communication of the 29th ult. is received. In this city we use for the smaller local sewers glazed stoneware pipe. No cement pipe whatever is used.

I have used cement pipe in railroad drainage, and found that it breaks easily. My opinion is that the stoneware pipe is decidedly preferable to the cement pipe for sewer purposes. The want of time is my excuse for the brevity of this reply.

Yours truly,

GUSTAV SCHALBACH, City Surveyor. .

CITY ENGINEER'S OFFICE,
SPRINGFIELD, ILL., September 5, 1872. }

J. B. Moulton, City Engineer :

DEAR SIR : Yours of the 29th ult. was received, and I owe you an apology for not answering sooner. In answer to your request for my opinion on the subject of using vitrified glazed stoneware pipe, as compared to cement pipe, for sewers, I will say that, for myself, I should much prefer the stoneware pipe, as your assertion that the cement pipe is seldom of a perfectly uniform texture, and is very easily broken, is true, and I don't consider it as safe and durable as the stone pipe. If you have laid much of the cement pipe, I think your experience has taught you that, when the cement pipe is saturated with water, it becomes very brittle and difficult to lay with success ; and unless I was laying sewers of very large calibre, where I could lay it in the ground like concrete, I should much prefer the stoneware, as I am satisfied it will be as enduring as time. Will you take the trouble to give me your form of ordinance for establishing the grades of your city, and such ideas as you may be willing to suggest?

Very respectfully,

W. D. CLARK.

NEW HAVEN, CT., September 6, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR Sir : Your favor of the 29th inst. was duly received.

As an answer to your questions concerning cement pipes for sewers, etc., I will state that the city of New Haven has used nothing but cement pipes for the pipe sewers that have been constructed here, and large quantities are still being used.

Thus far we have had no trouble with them, and so far as I have examined them where they have been down a number of years, to all appearances they are better than when first laid.

E. S. Chesbrough, Esq., City Engineer of Chicago, who is the author of our "Sewerage System," does not approve of their use here, and we consider him the best of authority. Probably the pipe made here are as good as any in the country, and appear to stand well wherever used ; still, for all that, I do not approve of their use. I believe there are other drain pipes made which can be relied on without any doubt, and to see such quantities of cement pipe used here in the construction of our sewers causes me some uneasiness, for the time may come when we shall find that the experiment has been tried on too large a scale. I have sent you one of our "Year Books," containing some information concerning our sewers. Any reports relating to sewerage in your city would be thankfully received.

Respectfully,

CHAS. E. FOWLER, City Engineer.

NATCHEZ, MISS., September 6, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : I am unable to add my evidence in reply to your favor of August 29. Natchez has never, is not now, nor will, I think, as long as governed by negro gentlemen, be blessed with sewers beyond brick culverts.

The Natchez, Columbus and Jackson Railroad, now in construction, Colonel S. M. Preston, Engineer, are using vitrified piping for culverts in preference to cement pipes. What their objections are, I am not aware of. Sorry that I am not able to oblige you,

I remain,

CHAS. C. NAUCK, City Engineer.

PATERSON, N. J., September 6, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : Yours of August 29th, in reference to the use of cement sewer pipe, is at hand. I regret that I am unable to give you any information that will be of service. We have no experience as to cement sewer pipe in this city, never having used any but the Scotch vitrified ware, and no other can be used unless the ordinances of the city are changed.

As with you, a pressure is made on our Board of Aldermen, by the manufacturers of cement pipe here, to have their pipe substituted, but thus far without success. I am prejudiced against their use, except for clear water ; have examined the process of making cement pipe, and do not believe that sufficient care is taken to have them of uniform texture, and that if sufficient water be used to make the mass homogeneous, the time taken to have the pipe properly made, and the cement well set, would make the cost of cement pipe as great as vitrified ware. The question is now being agitated here, and if in your inquiries in other quarters you arrive at a conclusion, whether favorable to their use or otherwise, I will be under many obligations to you, if you will mail the information to me (if printed). I intend to make some investigation in this direction, as soon as I can spare the time ; until then, I do not believe any change in the character of the pipe will be made by our Board of Aldermen.

Yours very truly,

A. II. FONDA,

City Engineer.

LYNN, September 7, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : I received your letter a few days ago, and have delayed answering it, thinking I might get some information from Salem, but have been disappointed.

We have never used the cement pipe, though often urged to do so ; therefore, I cannot speak from experience, but have been told of instances where sewage had taken the life out of the pipe, so that it crumbled to pieces.

The Committee on Drainage have examined the subject at different times, and have always used brick or stoneware for sewers.

A few private parties have used the pipe, and I have noticed that there was a difference in the pieces. Some were hard, and others would crumble in the hand. I have been told that in Salem and Boston they had been obliged to take up some cement pipe which had been laid only a few years.

Yours respectfully,

ISAAC K. HARRIS,
City Engineer.

PROVIDENCE, September 6, 1872.

J. B. Moulton, City Engineer :

DEAR SIR : The Sewerage Department of this city have used no cement pipes for the same reasons that you name, although they are made in this city, and used for that purpose by private parties. The very best imported pipes are used for sewers. I can see no reason why the cement pipes should not be used to a limited extent, where the circumstances are favorable, and where not subject to the action of acids. There seems to be some difference of opinion among practical men about them, but in deference to Mr. Shedd's opinion (the Chief Engineer of the Water Works), there are none now used by the city.

Yours truly,

CHARLES E. PAYNE,
City Engineer.

OMAHA, NEB., September 8, 1872.

J. B. Moulton, City Engineer :

DEAR SIR: Yours of the 29th ult. is received. In reply I will state that this city has made but very little use of cement pipe of any kind; but the Omaha and Northwestern Railroad Company have had in the neighborhood of 1,500 feet placed upon their road some six months ago, all of which proved a failure, owing to their want of sufficient strength to support the requisite pressure.

From my observations of the pipe, I should not recommend it for sewerage purposes :

1. Because they are more or less subject to disintegration from acids.

2. Their peculiar construction requires a better class of skilled labor in the setting than is usually secured.

3. Their efficiency depends so much upon the peculiar selection of material entering their composition, that few manufacturers manage to secure a proper cement and proportion of clean gravel or sand requisite in pipes for sewer purposes.

Mr. R. C. Phillips, formerly City Engineer of Cincinnati, and now Chief Engineer of Public Works in the District of Columbia, while here lately, expressed himself to me as in favor of glazed clay pipe in preference to those of cement. With regrets that I have been unable to reply earlier to your letter of inquiry, I remain,

Yours respectfully,

ANDREW ROSEWATER, City Engineer.

KEENE, N. H., September 12, 1872.

J. B. Moulton, Esq., City Engineer :

DEAR SIR: Yours of the 29th ultimo was duly received in my absence. We have as yet but little experience in sewerage in this place. I have made some inquiries as to the best material, and the general opinion is that the hard burnt, well vitrified stoneware pipes would be preferable for sewerage to cement.

Yours, very truly,

GEO. W. STUDEVANT, City Engineer.

THE COST OF CLEANING SEWERS.

Extract from a statement made by the Engineer for the construction of sewers of the city of New York (published February 3, 1873):

The usual price of cleaning sewers by hand is about \$2.50 per load, and while under a good sewer system solid deposits should be carried off with the flow, the city has been yearly paying from \$27,000 to \$46,000 per year to remove them. It is notorious that persons who, under the old Tammany *régime*, had the contracts for cleaning these sewers, finding it profitable to remove the deposits at \$2.50 per load, were in the habit of putting obstructions in the sewers with a view of creating solid deposits. The present Commissioner of Public Works has, however, put a stop to all this, and last year reduced the cost of cleaning the sewers to \$14,412 against \$44,690 for the year 1871. The following table furnished by Engineer Towle shows the comparative cost of cleaning brick and pipe sewers from 1867 to

1871 inclusive. The water supply having increased last year, the department has resorted to the flushing process, and two or three nights per week the water from the hydrants have been let into the sewers, reducing the expense of cleaning for the year to \$14,000.

Years.	BRICK SEWERS.			PIPE SEWERS.			Proportion of Brick to Pipe.	Proportionate Cost of Cleaning Brick to Pipe Sewers.
	Total Length in City in Linear Feet.	Number of Loads removed.	Cost of Removal.	Total Length in City in Linear Feet.	Number of Loads removed.	Cost of Removal.		
*1867..	1,058,136	13,073	\$32,682	150,022	50	\$125	7 5-100 to 1	261 46-100 to 1
1868..	1,068,817	19,558	48,295	222,020	80	200	4 81-100 to 1	241 48-100 to 1
1869..	1,088,911	11,002	27,730	288,120	200	500	3 78-100 to 1	55 46-100 to 1
1870..	1,120,234	18,518	46,420	335,313	597	1,442	3 34-100 to 1	32 18-100 to 1
1871..	1,152,054	17,374	43,435	346,903	502	1,255	3 32-100 to 1	34 61-100 to 1

* The construction of pipe sewers was commenced about 1865, and no considerable amount was paid for cleaning them until 1869.

The cost given in the schedule for pipe sewers includes the expenses of repair, the removal of broken pipes when encountered, and relaying new ones.

In all cases where the pipe sewers have required cleaning or repair, their failure to work has been traced to error or unfaithfulness in their construction.

ENGINEER'S OFFICE,
DEPARTMENT PUBLIC WORKS. }
NEW YORK, March 13, 1872. }

DEAR SIR: Your letter of the 11th inst., in relation to comparative value of cement and vitrified glazed pipes used for the conducting of sewage is received.

This department uses the vitrified glazed pipes for small sewers. There has been no cement pipes used for this purpose in this city.

Some of our brick sewers have been injured by the action of acids eating up the cement in the joints.

Mr. Tracy joins with me in saying that when acids and gases are carried in the sewer (and they carry very varied compounds), that the acids will disintegrate the cement pipes, or at least cause such risk as that it would be better to put in the vitrified pipes, which have been found to withstand this chemical action.

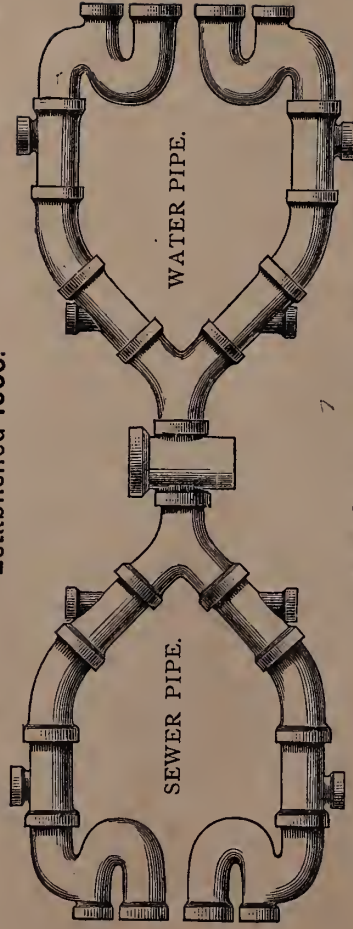
Very respectfully yours,

JOHN C. CAMPBELL,
1st Assistant Engineer.

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